

**DIGITIZING NORTH AMERICAN  
LICHEN AND BRYOPHYTE  
SPECIMENS**  
(powered thru [http://  
symbiota.org](http://symbiota.org))

**Corinna Gries  
Edward Gilbert  
Thomas H. Nash III**

2.5 million  
specimens,  
69 institutions,  
2.5 years later

# BRYOPHYTES AND LICHENS

- Different evolutionarily but similar in size and habitats occupied (epiphytes, soil mats, and rocks)
- Both dominate much of the arctic and northern boreal regions (lichens in upland areas and bryophytes in wet habitats.
- Both also occur commonly in many other ecosystems (deserts to tropics)
- Bryophytes, particularly in peat bogs store a major part of the worlds organic carbon
- Both are very useful in deposition monitoring

# LICHENS BRYOPHYTES CLIMATE CHANGE

- Original NSF ADBC funding 2011
  - ~ 2.3 million specimen (90%)
    - 900,000 lichens
    - 1.4 million bryophytes
  - 65 non-governmental US herbaria (95%)
  - 16 digitization centers (collaborators)
  - Mobilizing additional existing digital records (7 added so far)
- 3 PEN proposals funded 2012 & 2013
  - Add 220,000 specimens and 4 digitization centers.



# PARTICIPATING HERBARIA

**Lichens, Bryophytes and Climate Change**

**ALA (University of Alaska Museum)**

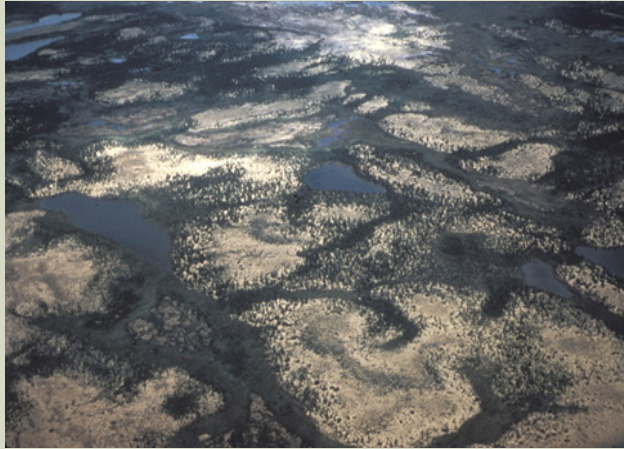
Lichens:	23000
Bryophytes:	39955
Total number of project specimens:	62955
Imaging Institution:	ALA

UNIVERSITY OF ALASKA MUSEUM OF THE NORTH

Find: recent\_p | Next | Previous | Highlight all | Match case | Phrase not found



# Deposition Monitoring: Radionuclides

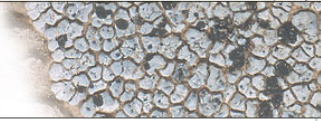


- 1. By the mid-1960's the natives of Anaktuvuk Pass, Brooks Range, Alaska had the highest radioactive body burdens of any population in North America. The source was Soviet above ground A-bomb tests at similar latitudes. Radioactive accumulation occurred in the lichens, which were eaten by caribou, that formed most of the human diet.
- 2. Lichens also used extensively to document Chernobyl fallout across Europe in the 1980's'.

# PORTALS

## Consortium of NORTH AMERICAN LICHEN HERBARIA

Photos by F. Burzycki



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### Dynamic Floras

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### Welcome to the Consortium of North American Lichen Herbaria

The Consortium of North American Lichen Herbaria (CNALH) was created to serve as a gateway to distributed data resources of interest to the taxonomic and environmental research community in North America. Through a common web interface, we offer tools to locate, access and work with a variety of data, such as keying to species.

The CNALH data portal is more than just a web site - it is a suite of data access technologies and a distributed network of universities, botanical gardens, museums and agencies that provide taxonomic and environmental information. Initially created to integrate databases between Arizona State University and the Santa Barbara Botanical Garden, the consortium is growing to extend its network to other partners within North America.

Join the Consortium of North American Lichen Herbaria as a regular visitor and please send your feedback to [CNALHadmin@asu.edu](mailto:CNALHadmin@asu.edu)

### News and Events

- [NSF Press Release 11-136](#) - US National Science Foundation awarded support to a collaboration of herbaria in order to database ca. 2.3 million North American lichen and bryophyte specimens ([NSF ADBC 1115116](#))
- **September 2011** - 543302 occurrence records integrated into data portal supplied by 15 different data providers

- Lichen portal (<http://lichenportal.org>)

Photos by M. Von Konrat

## Consortium of NORTH AMERICAN BRYOPHYTE HERBARIA



### Main Menu

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### Welcome to the Consortium of North American Bryophyte Herbaria

The Consortium of North American Bryophyte Herbaria (CNABH) was created to serve as a gateway to distributed data resources of interest to the taxonomic and environmental research community in North America. Through a common web interface, we offer tools to locate, access and work with a variety of data, starting with searching databased herbarium records.

The CNABH data portal is more than just a web site - it is a suite of data access technologies and a distributed network of universities, museums and agencies that provide taxonomic and environmental information. Initially created with financial assistance from the American Bryological and Lichenological Society, the consortium is growing to extend its network to other partners within North America.

Join the Consortium of North American Bryophyte Herbaria as a regular visitor and please send your feedback to [CNABHadmin@asu.edu](mailto:CNABHadmin@asu.edu)

### News and Events

- [NSF Press Release 11-136](#) - US National Science Foundation awarded support to a collaboration of herbaria in order to database ca. 2.3 million North American bryophyte and lichen specimens ([NSF ADBC 1115116](#))
- **June 2011** - 822457 occurrence records integrated into data portal

- Bryophyte portal (<http://bryophyteportal.org>)

# Overall Project Workflow

- Label imaging with key metadata (searchable thereby)
  - images to HUB server
- OCR (optical character recognition) & NLP (natural language programming run on all images – major IT effort
- Images and transcription pages available side by side through the two portals
- Transcription thru editors, students, volunteers (with a national coordinator)
- Georeferencing in batches through Geolocate
- Duplicates imported or handled through exsiccati module
- *GOAL*: completed, searchable databases available through the lichen and bryophyte portals powered by Symbiota

See <http://lbcc.limnology.wisc.edu/>

# PROGRESS: OCR AND NLP

## University of Wisconsin - Madison (WIS)

[Home](#) >> [Crowd Sourcing Central](#) >> Editor

[<](#) [<<](#) | 4 of 2615 | [>>](#) [>](#)

Occurrence Data | Determination History | Images | Genetic Links | Admin

**Collector Info** Short Form <<

Catalog Number ? Other Numbers ? Collector ? Number ? Date ? Dupes?

WIS-L-0013032 [ ] Teuvo Ahti [ ] 1967-07-27  Auto search

Associated Collectors ? Verbatim Date ?

Exsiccati Title Number

**Latest Identification**

Scientific Name ? Author ?

Cladonia bellidiflora (Ach.) Schaerer

ID Qualifier ? Family ? Cladoniaceae

Identified By ? Date Identified ?

**Locality**

Country State/Province County Municipality

USA Alaska [ ] [ ]

Locality

Thompson Pass Mile 25.2 Richardson Hwy.

Locality Security

Latitude Longitude Uncertainty ? Datum ? Verbatim Coordinates

61.16667 -145.66667 [ ] Tools [ ] << 61°10'N, 145°40'W

Elevation in Meters Verbatim Elevation

838 [ ] - [ ] << 2750 ft.

**Misc**

Habitat

In montane tundra.

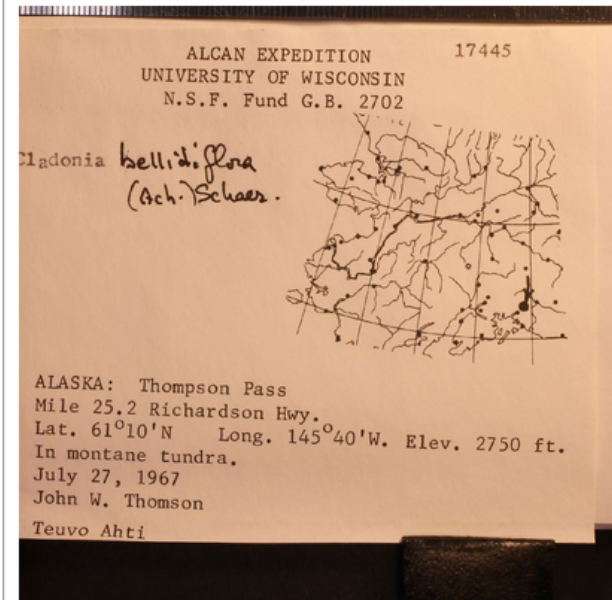
Substrate

Associated Taxa

Description

Notes

## Label Processing



OCR Image

Options

- OCR whole image
- OCR w/ analysis

Image 1 of 1

ALCAN EXPEDITION  
UNIVERSITY OF WISCONSIN  
N.S.F. Fund G.B. 2702  
Cladonia  
J  
17445  
1 c I  
'nr/  
ALASKA: Thompson Pass Mile 25.2 Richardson Hwy.  
Lat. 61°10'N Long. 145°40'W. Elev. 2750 ft. In  
montane tundra.  
July 27, 1967 John W. Thomson  
Teuvo Ahti



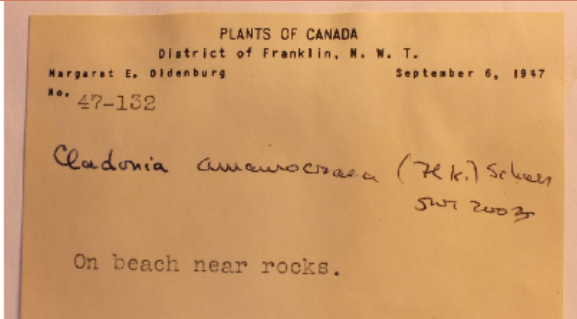
# GEO-REFERENCING

Associated Collectors  Other Catalog Numbers ?

**Latest Identification**  
Scientific Name:  Author:   
ID Qualifier: ?  Family:   
Identified By:  Date Identified:

**Locality**  
Country:  State/Province:  County:  Municipality:

Locality:   
 Locality Security  
Latitude:  Longitude:  Uncertainty (meters) ?  Datum ?   
Latitude: 52 ° 30 ' 0 " N  
Longitude: 79 ° 0 ' 0 " W  
  
Zone:   
East:   
North:   
Hemisphere: North



**1 possible location(s) found.** powered by: GEOLocate

Georeference a locality description

Locality String:    
Country:

Supervised batch geo-referencing

# CROWD SOURCING

## (EDUCATION AND OUTREACH)

- John Brinda – Missouri Botanical Garden – national coordinator
- Volunteer program within LBCC, such as the Field Museum (Eve Gaus) and the California Academy of Science (Alison Young)
- volunteer interface is: <http://lbcc1.acis.ufl.edu/>
- American Bryological & Lichenological Society members
- Sophisticated User and Workflow Management System in SYMBIOTA (Ed Gilbert)
  - Transcription
  - Geo-referencing
  - Professional quality control

# PROGRESS: VOLUNTEER INTERFACE

Documenting North American lichen and bryophyte collections..

962,302  
images

2,747,945  
records



### News...

- ~143,000 labels were imaged this summer
- [Lichen Exsiccati now](#)

### ALCAN Expedition



Map of the Alaska Highway (ALCAN Highway)

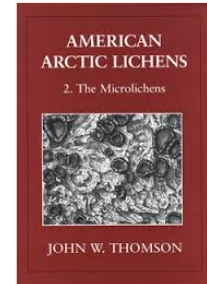
The ALCAN Highway was constructed during World War II for the purpose of connecting the contiguous United States to Alaska through Canada. It begins at the junction with several Canadian highways in Dawson Creek, British Columbia, and runs to Delta Junction, Alaska, via Whitehorse, Yukon. Completed in 1942 at a length of approximately 2,700 km (1,700 mi).



John Thomson



Teuvo Ahti



Flora of American Arctic Lichen

The eminent American lichenologist, John W. Thomson, and the young Finnish lichenologist, Teuvo Ahti, who has since become the world expert in the large lichen genus *Cladonia*., traveled the Alcan Highway together in 1967, after John had spent a sabbatical in Helsinki. The road was primarily gravel at that point in time, and they had to change tires 13 times. This was one of John's early expeditions to the American arctic. Across his 40 year career at the University of Wisconsin, he mounted 14 major expeditions across the Canadian and American arctic resulting in an American Arctic Lichen Flora published in two volumes. The Alcan trip of John and Teuvo cemented a lifelong friendship and spurred continued collaboration over several decades. They were among the first lichenologists to traverse the highway and the lichens collected provided an important contribution to the final flora treatments.

### Get Involved...

Learn more about [volunteering to digitize bryophyte and lichen collections.](#)

Visit our [lichen and bryophyte record sets of historic expeditions and special collections.](#)

Go directly to the data portals for [lichens](#) or [bryophytes](#) .

### Recent LBCC Blog Posts

- [Summer of Imaging](#)

[More](#)

### Create Your Own Expedition or Record Set Link

Country  State/Province

Family  Genus

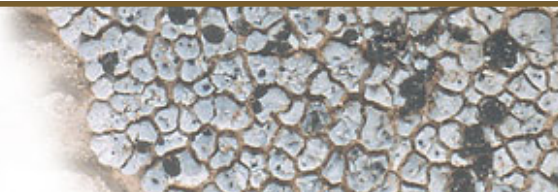
Collection

OCR Fragment

[Click To Go To Records](#)

[Reset](#)

# Consortium of NORTH AMERICAN LICHEN HERBARIA



[Home](#) >> Crowdsourcing Score Board

## Crowdsourcing Score Board

### Top Scores





User	Score
Miadlikowska, Jolanta	2264
Studer, Alyssa	2256
McMullen, Molly	818
Smith, Julie	604
Nash, Thomas	154
Doucette, Alfonso	122
Wonders, Quinn	48
Gilbert, Edward	40
Anglin, Robert	10
Adamo, Michael	4

### Current User's Status

#### Current Standing

**Specimens processed:** 1  
**Pending points:** 2 (review records)  
**Approved points:** 0  
**Total Possible Score:** 2

### User Stats by Collections

Collection	Specimen Count	Pending Points	Approved Points	Open Records
Duke University Herbarium (DUKE) 	0	0	0	11084
New York Botanical Garden (NY) 	0	0	0	419
Boise State University Lichen Herbarium (SRP) 	0	0	0	21614
University of Wisconsin - Madison (WIS) 	1	2	0	75011

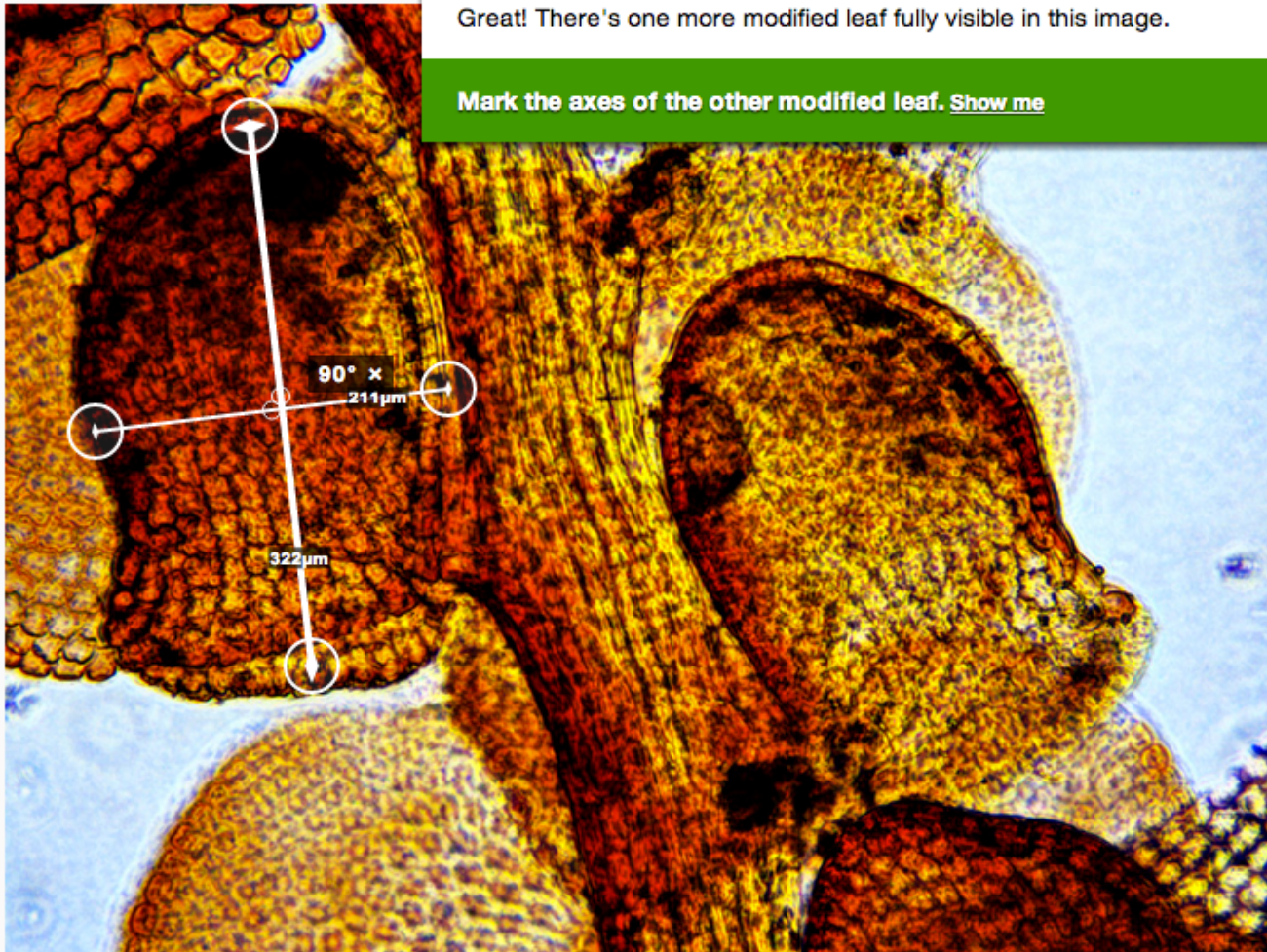






Great! There's one more modified leaf fully visible in this image.

Mark the axes of the other modified leaf. [Show me](#)



### Measure the modified leaves

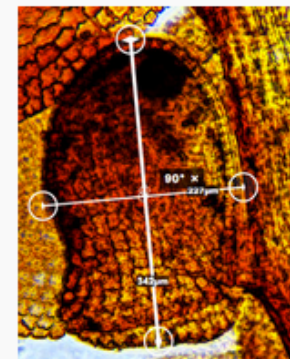
Look for round bulges representing sac-like structures and measure the longest and widest axes.

[Finish this image](#)

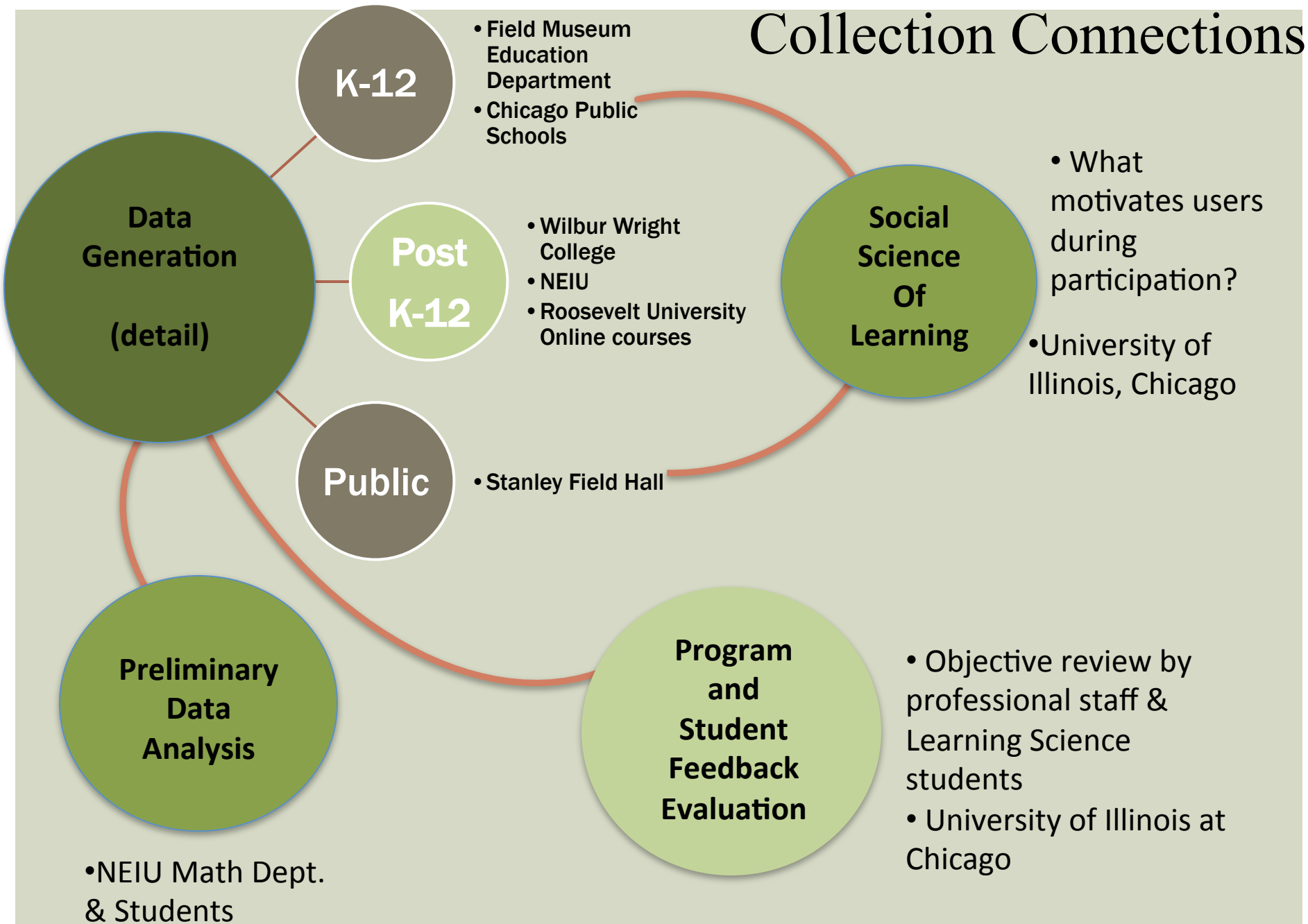
If you need some help, [restart the tutorial](#) or [read frequently asked questions](#).

When you'd like to stop, please [fill out a short survey](#).

Remember: Mark the long and short axes, like this:



# Collection Connections





# Visions for the future...

Expand The Field Museum's involvement in Citizen Science initiatives

Integrate in to K-12 classroom

- RET for ARTS

- Virtual Visits from The Field*

- N.W. Harris Learning Collection boxes

# THANK YOU NSF

- Michael Adamo
- Bruce Allen
- Meredith Blackwell
- Bill Buck
- Alina Freire-Fierro
- John Freudenstein
- Alan Fryday
- David GIBLIN
- Karen Hughes
- Steffi Ickert-Bond
- Timothy James
- Jennifer S. Kluse
- Matt Von Konrat
- Ben Legler
- Tatyana Livshultz
- Robert Lücking
- Francois Lutzoni
- Bob Magill
- Andrew Miller
- Brent Mishler
- Donald Pfister
- Richard Rabeler
- Malcolm Sargent
- Edward Schilling
- Michaela Schnull
- Blanka Shaw
- Jon Shaw
- Carol Shearer
- Larry StClair
- Barbara Thiers

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